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## **Near shore wind turbines and their cost advantages: Does their cost advantage outweigh the preferences for visual disamenities reduction they elicit?**

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Given the high cost of traditional off-shore wind farm locations, near-shore wind farm expansions are planned in Denmark to reduce the costs of expanding the wind energy capacity. Preferences for locating wind expansion sites further offshore have been documented in several studies, but it is not clear whether the cost advantages at specific sites are correlated with the preferences against siting in that precise location.

Cost curves for off-shore wind farms often exclude the near-shore locations, as these are seen as already exploited. There is, therefore, a need to investigate a realistic cost curve for near-shore wind farms and determine what is actually the cost advantage relative to the potentials further ashore.

### **Approach**

We determine a quantification of the average cost advantage for near shore wind farms relative to further ashore wind farms in Denmark and the preference pattern. First, we investigate whether the cost advantages necessarily have to be associated with substantial preferences against this location, utilising existing cost and preference data. Specifically, we compare the costs and associated preferences from locating near-shore wind-farms at remote positions, with the cost of siting in locations closer to urbanised areas and existing infrastructure.

Secondly, we examine the possible existence of design considerations relating to near-shore wind farms that could influence the public perception and preferences with only minor cost additions. Potentially, the design modifications and specific technology employed may positively influence the preferences relative to the effects that similar modifications far offshore would result in.

### **Main body**

For the aggregate wind planning in Denmark it is important to determine, first, if it is possible to minimise the public acceptance costs if the locations for near-shore expansion sites are chosen based on known patterns of preferences; and second, if it is possible to identify additional potentials for future near-shore wind expansion. This would allow to plan a further expansion of wind capacity with fewer costs than a similar mainly far off-shore based expansion would require.

### **Conclusion**

The trade-off between locating wind farms at far offshore locations with relatively low public resistance, but high investment costs; and locating them at near-shore locations that reduce investment costs but elicit higher resistance from the public based on visual disamenities and recreative use impact is of crucial importance.

The cost advantage associated with locating wind farms closer to the shore is substantial on average, and when combining this information with preference studies results it is possible to determine locations, and possibly also designs, that would reduce resistance from the public.

We find that the variation in costs at near-shore locations and the combined variation in preference results suggest that the near shore potential with total benefits relative to far ashore locations can significantly contribute to further Denmark's wind expansion.

### **Learning objectives**

- 1) Improved knowledge about the cost differentials between near-shore wind expansion and far ashore wind expansion as expressed in cost curves for the different potentials
- 2) Indicative quantification on whether the preferences against near-shore locations could outweigh the cost advantages they present, and if the variation for preferences between locations could favour some categories of near-shore wind expansion above others.